**USDA-ARS/**
**U.S. Wheat and Barley Scab Initiative**
**FY18 Performance Report**
**Due date:** July 12, 2019

## Cover Page

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| **Principle Investigator (PI):** | Matthew Bakker |
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| **Phone:** | 309-681-6589 |
| **Fiscal Year:** | 2018 |
| **USDA-ARS Agreement ID:** | N/A |
| **USDA-ARS Agreement Title:** | Novel Microbial Antagonists of F. graminearum Rachis Spread and Spore Production. |
| **FY18 USDA-ARS Award Amount:** | $ 58,419 |

## USWBSI Individual Project(s)

| USWBSI Research Category* | Project Title | ARS Award Amount |
|---|---|---|
| PBG | Novel Microbial Antagonists of F. graminearum Rachis Spread and Spore Production. | $ 54,954 |
| | **FY18 Total ARS Award Amount** | **$ 58,419** |

7 June 2019

Principal Investigator Date

* MGMT – FHB Management
FST – Food Safety & Toxicology
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
EC-HQ – Executive Committee-Headquarters
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Soft Winter Wheat Region
SWW – Southern Soft Red Winter Wheat Region

**Project 1:** *Novel Microbial Antagonists of F. graminearum Rachis Spread and Spore Production.*

## 1. What are the major goals and objectives of the project?

There are 2 main goals for the project:

**1:** Identify beneficial microorganisms that are able to extensively colonize the rachis, constraining *Fusarium* secondary spread.

**2:** Identify specialist parasites of *Fusarium* perithecia on crop residue.

## 2. What was accomplished under these goals?

*Address items 1-4) below for each goal or objective.*

**Goal #1:**

1) major activities:

A range of fungi were screened for the ability to colonize wheat stems. Fungi were inoculated into wheat stems using toothpicks, and colonization was assessed by plating stem pieces onto fungal growth media.

After initial screening, a smaller number of fungi were advanced to assays in which *Fusarium graminearum* was also present, to test for possible reductions in disease spread.

2) specific objectives:

Determine the ability of range of fungal taxa to spread across distance when introduced to wheat stems.

Test whether fungi with good ability to colonize wheat stems reduce the spread of Fusarium head blight disease.

3) significant results:

Identified that nodes represent substantial barriers to the spread of many fungi.

Identified *Sarocladium* as a genus of fungi that has excellent ability to spread within wheat stems.

Among several *Sarocladium* species and isolates, identified one isolate that consistently reduces Fusarium head blight disease progression.

4) key outcomes or other achievements:

From the broad range of fungi that were tested, we have been able to focus in on *Sarocladium* as a promising genus for colonizing wheat stems extensively, while producing no disease symptoms or negative impacts on plant performance. One particular *Sarocladium* isolate consistently reduces Fusarium head blight disease progression.

**Goal #2:**

1) major activities:

A microcosm assay was developed for studying production of perithecia by *Fusarium graminearum*.

The identity of bacteria that associate with *Fusarium* perithecia was determined, using microbiome profiling techniques.
The impacts of mixed soil bacteria, or of individual bacterial isolates, on perithecia formation was assessed.

2) specific objectives:
Identify microorganisms that associated with *Fusarium* perithecia.
Test these microorganisms for the ability to reduce perithecial number.

3) significant results
Microbiome profiling revealed several bacterial taxa associated with *Fusarium* perithecia.
Representatives of several of these taxa are being tested for impact on perithecial number.

4) key outcomes or other achievements:
Identification of candidate bacterial taxa for interactions that could reduce *Fusarium* inoculum production.

**3. What opportunities for training and professional development has the project provided?**

This project has provided a technician trainee with his inaugural experience in a research setting. The technician has received hands-on training and experience in a wide range of laboratory techniques.

**4. How have the results been disseminated to communities of interest?**

Nothing to report; studies are on-going and results have not yet been summarized & communicated.

# Training of Next Generation Scientists

**Instructions:** Please answer the following questions as it pertains to the FY18 award period. The term "support" below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student's stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

1. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY18 award period?**
   Not applicable.
   **If yes, how many?**
   Not applicable.

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY18 award period?**
   Not applicable.
   **If yes, how many?**
   Not applicable.

3. **Have any post docs who worked for you during the FY18 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   Not applicable.
   **If yes, how many?**
   Not applicable.

4. **Have any post docs who worked for you during the FY18 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**
   Not applicable.
   **If yes, how many?**
   Not applicable.

# Release of Germplasm/Cultivars

**Instructions:** In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY18 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations.

*NOTE: Leave blank if you have nothing to report or if your grant did NOT include any VDHR-related projects.*

| **Name of Germplasm/Cultivar** | **Grain Class** | **FHB Resistance** (S, MS, MR, R, where R represents your most resistant check) | **FHB Rating** (0-9) | **Year Released** |
|---|---|---|---|---|
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Add rows if needed.

**NOTE:** List the associated release notice or publication under the appropriate sub-section in the 'Publications' section of the FPR.

**Abbreviations for Grain Classes**

Barley - BAR
Durum - DUR
Hard Red Winter - HRW
Hard White Winter - HWW
Hard Red Spring - HRS
Soft Red Winter - SRW
Soft White Winter - SWW

# Publications, Conference Papers, and Presentations

**Instructions:** Refer to the FY18-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY18 grant. Only include citations for publications submitted or presentations given during your award period. If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

NOTE: Directly below each reference/citation, you must indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in publication/ presentation. See example below for a poster presented at the FHB Forum:

> Conley, E.J., and J.A. Anderson. 2018. Accuracy of Genome-Wide Prediction for Fusarium Head Blight Associated Traits in a Spring Wheat Breeding Program. In: Proceedings of the XXIV International Plant & Animal Genome Conference, San Diego, CA.
> Status: Abstract Published and Poster Presented
> Acknowledgement of Federal Support: YES (poster), NO (abstract)

Nothing to report.

**Journal publications.**

**Books or other non-periodical, one-time publications.**

**Other publications, conference papers and presentations**.